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EXAMINING NIGERIAN MINING LICENCES AND SETTLEMENTS

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ABSTRACT
Nigeria is in the process of restructuring the non-oil sector as part of efforts to remedy disproportions in the national economy, and the solid mineral sector is central for diversification. As part of the reforms in the sector, a mining cadastre was instituted to issue mining licence and permit to potential investors. A national and state level analysis by a Geographic Information System (GIS) indicated that licences are widespread; a positive outcome for mineral development. However, the mining cadastre hardly takes into account mining-prohibited areas, built-up areas and other physical features that are overlapping mining licences. In this case, settlements that are currently or likely to be affected by mining activities are about 10 per cent. The Nigerian experience shows that the integration of other land-use data in permitting process, and the creation of mining buffer zone are necessary to prevent conflicts and in addressing mining-related impacts.

KEYWORDS: GIS, Nigeria, Ondo, mining, cadastre, settlement, buffer

INTRODUCTION

With the strategic drive towards reforming the Nigerian mining sector to become the largest contributor to the national economy after oil, mineral licences are ambitiously issued to ensure that the sector becomes a revenue generator for the government. Under Section 5(1) of the new mining law (Mineral Act 2007), a right for mineral activities is granted by the Mining Cadastre Office (MCO) on behalf of the Federal Government of Nigeria. As the permitting process steadily progresses, little or nothing is documented on the potential impact of the industry on the surrounding communities and the natural environment. Granted licences and permits commonly overlap other surface rights like private or public properties, forest reserves, conservation areas, farmlands and settlements, whilst, mineral exploration is prohibited in sacred areas and trees.

In recent times, society's increasing concern about the impacts of mining on communities and the surrounding environment has giving rise to opposition, to an extent of preventing the commencement of mining operations. For example, Bridge (2004) considers identifying communities and environment to be affected by mining as an impact management tool. To determine the extent of mining at the national level, therefore, requires not just traditional information about the quantity and types of mineral activities, but also information about the geographical location where the activity occurs, and a description of its relationship with the surrounding environment. In this instance, geographical locations of the different mining rights can be documented at a variety of spatial scales, from an exploration licence that may cover a wider area (often 100s to 1000s square kilometres), to a small-scale licence that may be less than a hectare of land. Thus, a geographic information system (GIS) can combine this variety of scales and create relationships to determine the spatial pattern of mining activities in relation to other features. The use of this tool is useful at permitting stage to identify those areas where mining is not permissible or may not be feasible due to legal restrictions and best practices.

This paper attempts to demonstrate how simple GIS analytical tools can be integrated in the MCO for the issuance of mining licence. The aim is to avoid overlap with other land use especially those prohibited by the law, and those areas prone to conflict. The study also pilot the use of buffer zone to show how it can be adopted to protect/prevent residents, environment, wildlife and commercial centre from mining-related impacts such as waste-rocks dumps, tailings dams, noise, dust and ground vibration, blasting and fly-rocks, among others. The lack of buffer analysis may be attributed to the conflict between communities and oil operators in the Nigerian oil producing regions of Nigeria. The

next section summarised the methods used in the study. In the results and discussion section relationship was established between settlements and mining licences at the national level. In order to understand the analysis at a reduced scale, a case study of mining in Ondo state was briefly documented. The paper concludes with a discussion of the implication of business-as-usual attitude, and the need for a mining buffer area to protect the surrounding settlements and the environment.

MATERIALS AND METHODS

Buffering operation is generally used in GIS to answer proximity queries of objects around points, lines and polygons based on each feature spatial and attribute values. Buffers provides a way of querying or asking site-specific questions to determine which entities occur either 'within' or 'outside' a defined zone (ESRI, 2010; Robert and Robert, 1993). Buffer operation is particularly useful in the study to determine the licences issued within a specified distance to existing settlements. Query functions by textual attributes displays various types of mineral licences in Nigeria. The same procedure was used to narrow the boundary from the national to state scale. Spatial query was used in locating licences and settlements within a particular distance. The proximity between mining licence and settlements is the range of distance covered from few 100 metres to less than one kilometre radius. However, this is not a 'text book' rule or 'right answer' regarding proximity yardstick between mining-area and settlements, as there are examples of communities that co-exist with mines (Hodge, 2009).

Based on the above criterion, it was at the author's discretion to select nearest and farthest buffer zones for further analysis. The combination of the different features used in this analysis is arranged into layers to form a map. Context operations, therefore, imply the creation of new layers based on existing features and the context within which each feature in the layer is found (Kitchin and Tate, 2000). Hence, the database was divided into as many layers as possible, where each layer contains one characteristic or a combination of features. For example, mining licences, settlements, and boundaries are all features that are present in separate layers. Licence was divided into exploration, mining, quarry and small-scale layers. In particular, exploration licences were queried to obtain oil sands (bitumen) licences. However, there is no specific rule on the organisation of layers; a look at figure 1 confirms that the bottom map was drawn from the top layer.

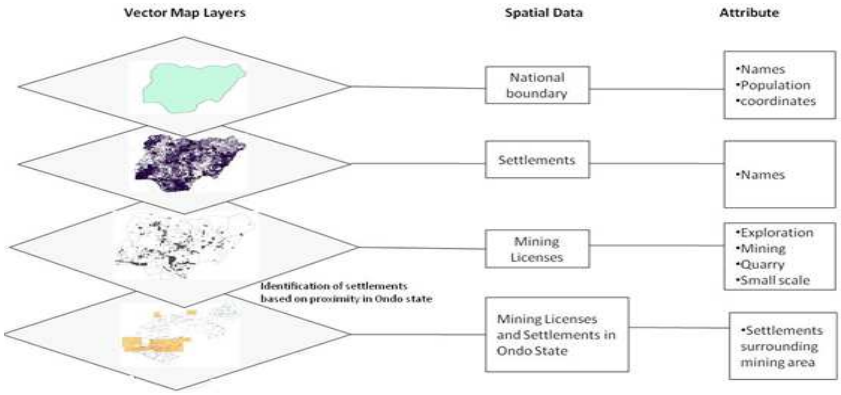

Fig. 1 Vector map layers showing scale of analysis.

An overlay process was adopted to create new output features. According to ESRI (2010), this method is useful in integrating different layers to locate areas that are suitable for a particular purpose. The overlay operation was used to determine which state has the highest number of bitumen blocks. Similarly, the layers of bitumen licences and settlements were, however, integrated to determine the communities that are lying in a bitumen block. Where settlements fall exactly on a boundary; the GIS used a predesigned decision rule to determine whether they are classified as being in a polygon or not, even if that is not the case in reality. The end result of the GIS processes shows in graphic the distribution of mining activities in Nigeria, and how this can be used in identifying and preventing potential mining-related impacts on communities and other environmental resources. The MCO made it possible for the information about mineral titles to be acquired and used for analysis. The data contains the revalidated mineral titles and permits obtained in April 2009. Since the approval of licences in the

cadastre is a daily routine, the presentation made is, however, limited to this date, nonetheless, it is a depiction of activities in the sector.

RESULTS AND DISCUSSION

Results from GIS querying operation shows that mines are operating or licenced in both built and conservation areas. While mineral licences granted are overlapping the land area administrated by other tiers of government, others are now licenced and exploited within the boundaries of local communities. The MCO is unable to provide mining applicants with information concerning existing rights, because the data are simply not available. This section tried to address this by demonstrating how mining has led to the growth and can lead to the disappearance of communities. In the following section, a buffer zone between mining licences and settlements was established to identify potential mining host communities based on their proximity to a mineral title.

Nigerian Mining and Settlements

Nigeria is predominantly an agrarian society (NPC, 2007); the beginning of mining in several ways has influenced rural settlements and agriculture. Mining has contributed directly or indirectly to the rapid expansion of existing communities and the creation of new ones. This was the case when in the late nineteenth to early twentieth century; tin mining in Nigeria played a historic role in the evolution and development of Jos, which became the largest settlement in the Plateau (Hodder, 1959). Jos is presently home to the administrative headquarters of Plateau State and a growing industrial centre. Initially, early settlements developed without systematic planning - typical of rapidly growing pioneer mining towns. The architecture, layout and function of these towns are reflected in their growth and change. Sabon Gida, Bukuru and Jos communities are also known as ‘stranger settlements’ because they are host to one-third of mining migrant labourers. During the same time, Maijuju and Fusan Hausawa settlements evolved as markets for the miners and their mineral products (Hodder, 1959). The mining of gold, iron ore, coal, lead, zinc and limestone also led to the growth of Abakaliki and Udi.

Since the beginning of the twentieth century mining continued to be fundamental in the expansion of settlements in some other parts of the country. In the north-central, gold and tin mining are important; in the south-west industrial minerals; in the south-east coal extraction is important; and in many parts of the country, settlements depended on mining and agriculture to prosper. Regardless of the present low mining activity, there are new settlements emerging. The current mining sector is dominated by exploration activity and a noticeable amount of artisanal and small-scale mining (ASM). Sarkin Pawa and Azara in Niger and Nassarawa States respectively, have growing ASM of tourmaline, tantalite and baryte. These settlements emerge with the ‘mineral rush’, but run the risk of diminished economic activities when the mineral deposits they are based on are depleted, because they are not built to live longer than the mines. A typical example of this kind of settlement is Old Birnin Gwari - which was, for a time famous for gold mining. Ajaokuta town is currently serving the several moribund iron ore mines, and steel workers. In summary, certain settlements were short-lived; and some disappeared, while others became ghost towns because of mineral depletion or changes in global mineral price and demand. Jos town was able to survive the once thriving economic activity, because it has developed a diversified economy that becomes a manufacturing and service centre for the entire region.

Setting a Mining Buffer

Mining settlements definition not only depends on the distance and proximity to the mining area, but also on the social and economic characteristics of these communities. This section identifies the communities that are ‘within’ or ‘near’ any given mining-licenced area in present times regardless of their functions. The data gathered, however, are unable to differentiate between the settlements that emerge at the same time as the mine or the settlements that were built before the mine. It also does not include the size and shape of the settlements. As such, any categorisation of mining communities based on their impacts becomes difficult. For this reason, proximity was relied upon to define the settlements that are closer to any mining licence or even contained within the licence.

Generally, there is no clear-cut spatial yardstick for demarcating a mining buffer area. Some countries and counties are, however, setting a buffer zone between mining and residential areas (Owen, 2011). For example in Australia miners are not permitted to work within a nine metre radius or 100 metres below a residence (Rural Law Online, 2009). In Scotland and Wales, a 500 metre buffer zone is

required undisturbed between mining and built areas. In England, efforts being made by Members of Parliament to define a mining buffer zone, suffered a setback, when the bill for a 500 metre buffer zone between new mines and residential areas was opposed by the government (Owen, 2011). Already a distance of 100-200 metres referred to as 'stand-off' is in place to minimise the impact of mineral extraction process. Nonetheless, there are examples of communities that co-exist with mines inside the community. Likewise, there are instances where coal burning smoke and vibration from coal blast have shattered nearby communities. Nigeria, like some other developing countries of Africa neither have 'stand-off' nor buffer zone; the attention is on intensifying mining activities without consideration for a buffer definition to give some form of protection to the environment and nearby communities. In this context, therefore, the study applied the GIS buffer operation to select the settlements that fall within the perimetre of mining rights, and those that are not within, but are closer to, the mining right. Proximity of 100-150 metres distance from the mining licence was created for those outside the mine area to understand the closeness of the activity. Figure 2 indicates the overlap of settlements and the number of mining licences covering the whole country. It is also possible to identify settlements that are located within any given licences by narrowing the scale, as indicated in Ondo State Example.

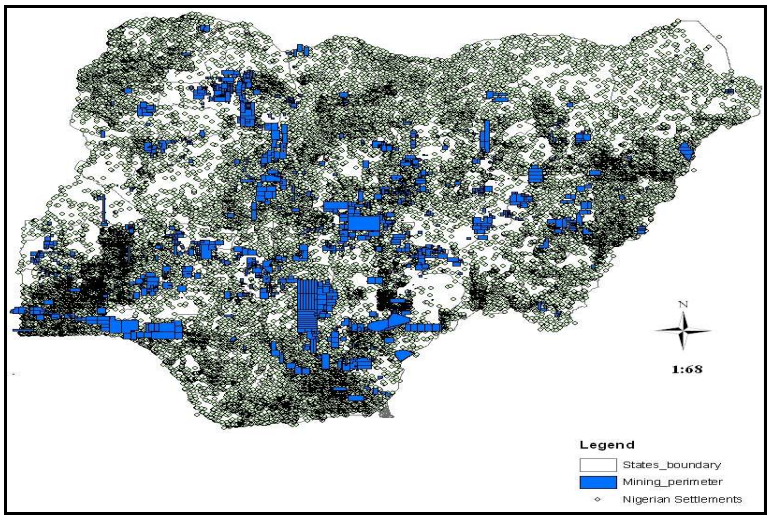

Fig. 2 Mining licences and surrounding settlements. Mining licences are in polygonal shapes and the settlements appear as point data clipped to the national boundary.

Based on the above criteria, about 10 per cent of all the settlements in Nigeria either fall completely within or are contained by the perimetre of any given mining licence. It must be noted that, one of the limitations of the analysis was of data scale and resolution. Because the settlement data are represented by point, it has discriminated the different classes of settlements, for instance; cities, towns, villages, hamlet etc, and whether or not the settlement are dispersed, nuclear or linear in shape. Nevertheless, an overlay of exploration licence and settlements indicates that about 3600 settlements, representing about eight per cent of the total settlements in Nigeria may be affected by exploration (Fig. 3). An exploration programme is extensive; however, it has a low impact on settlements, but compensation can be made for any disturbance. Since mining rights holders have the rights of entry to private lands, giving notification to the holders becomes an important part of community consent.

Narrowing the scale, the next section identifies mining communities in Ondo State, south-western Nigeria.

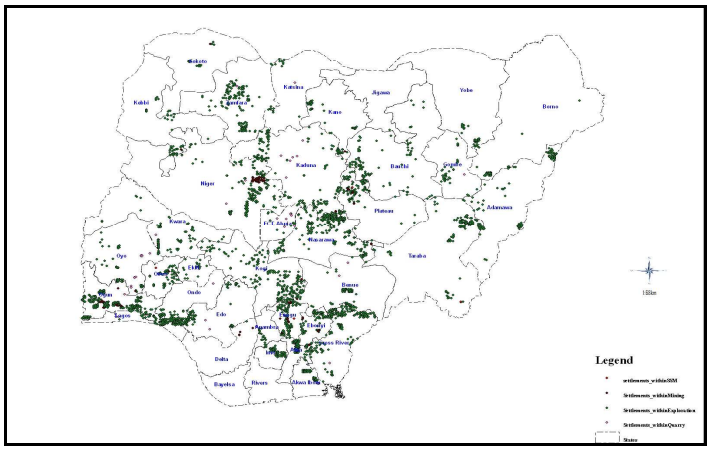

Fig. 3 Settlements lying within the perimetre of exploration, mining, quarry and small-scale mining (SSM) licences and permits.

Ondo State Example

Ondo is situated in south-western Nigeria with Akure being the capital city. The 18 local government councils making up the state were carved out from the former western states in 1976. The State is bounded to the south by the Atlantic Ocean, to the north by Ekiti State, Edo State in the east, and Ogun State to the west. Ondo is among the nine oil producing states of Nigeria with an estimated daily production capacity of about 20,000 bpd (Ondo State Web-portal, 2009). According to the 2006 population census, the state has about 3.5 million people living in an area of about 14,606 square kilometre, and it has been predicted that the population will reach 4.7 million by 2020 (UNDP, 2006). Ondo is an agrarian region with agriculture engaging over 70 per cent of the working population, unlike other Niger Delta states that are predominantly fishermen. One-third of the land surface is dedicated to agricultural production. Cash crops include rubber and timber; cotton and tobacco are mainly produced from the northern part of the state, while palm kernels are cultivated throughout the state. Indeed, Ondo is the largest producer of cocoa in Nigeria. Other agricultural products include fruits and vegetables, coffee, cassava, and rice.

Non-metallic minerals such as clay, aggregates, marble and kaolin are extensively found throughout the state, whereas mineral fuels such as coal and bitumen are localised within the sedimentary belt. Oil sands deposits (often referred to bitumen in Nigeria) are situated across six local government areas: Irele, Odigbo, Idanre, Okitipupa, Ese-Odo and Ilaje. The two major crude oil-producing local government areas (Igbokoda and Egbekebo) are bordering the local communities hosting oil sands deposit. The mineral resources in Ondo, including the economically viable ones, are unexplored and untapped - a situation similar to the picture at the national level. Since the beginning of the last century, however, about 100 of the 180 boreholes drilled in the bitumen belt of Nigeria are within Ondo State (Ayoade, 2007). In comparative terms, all mineral activity permits i.e. exploration, quarrying, small-scale mining and mining rights in Ondo State account for just 1.5 per cent of the national total. At present there is no large-scale mining activity taking place in Ondo State. Figure 4 is an indication that of all the licenses offered by the Federal Government for mining not one was issued to the state. Even at the small-scale level, there is only one recorded mine in the state. Perhaps the search for bitumen which dominates all exploration activities in the state has deterred other mining activities. Quarry license for extraction of construction material is widespread in the state because of the large volume of sand, clay, sandstones etc. The quarry industry accounts for 70 percent of mineral activities. The occurrence of glass sands in the coastal areas has led to the establishment of 'Oluwa Glass Company Plc'.

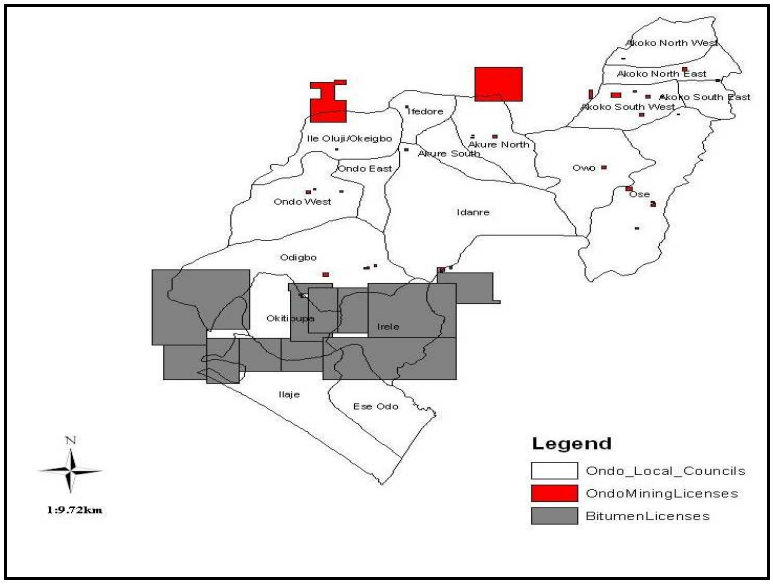

Fig. 4 Mineral permits in Ondo State.

The settlement pattern in Ondo is largely influenced by topography and drainage, and varies from one settlement to another depending on the concentration of people, and the functions the settlements perform. As noted earlier, Ondo is an agrarian state and so the settlements are rural in nature and dispersed to provide more land space for farming. There are 479 settlements recorded in Ondo State; 38 per cent of this falls within mining-licensed areas. From this proportion, more than two-third (about 80 per cent) are located within the bitumen-licensed areas (Fig. 5). The number of settlements has increased by creating a one kilometre square circumference around the oil sands mining licences. Consequently, all the rural settlements in Ondo State are found lying at the five square kilometre buffer. In reality, this result indicates that any settlement within the size of this buffer is likely to be affected shattered or displaced by oil sands extraction.

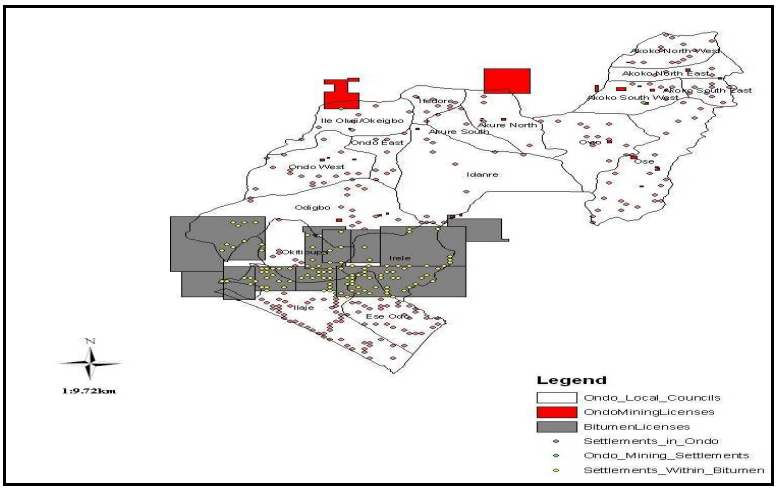

Fig. 5 Mining licence in settlement areas in Ondo State.

Undoubtedly, bitumen extraction would have both positive and negative socio-economic and environmental implications for the state. However, the regions in the northern part of the state are less likely to be closely affected by bitumen mining because not many mining activities are taking place in their immediate surroundings. These local councils include: Akure north, Akure south, Idanre, Owo, Ondo west, Akoko northwest, Akoko northeast and Ifedore. Those most likely to host major mining activity, considering the intensity of exploration, include: Ilaje, Okitipupa, Ire, Ese-Odo and Ose. Among them, Okitipupa and Ilalje are likely to derive dual benefits and costs because they are host to both crude oil extraction and the planned bitumen projects. Quarrying as the main mining activity in

the state occupies small amounts of operational space compared to bitumen that extends across the boundary of the state.

CONCLUSION

In order to understand the effects of overlapping mining licences on the built area, analysis was undertaken by overlaying mining titles and settlements. The analysis shows that mining licences are issued in both virgin lands and those inhabited by humans. Licences are found issued in local lands and habited areas, in fact, some minerals are exploited within the boundaries of communities. This is because of a lack of data on other land uses, and the absence of a mining buffer zone. In the absence of a country's buffer zone, the study used insights from other countries to determine the number of settlements that are either 'within' or 'near' a mining-licensed area. More than one-quarter of the settlements in Ondo State are lying within bitumen blocks - with potential effects based on their proximity.

The study contends that until government establishes 'mining buffer zone' or includes the establishment of 'mining buffer zone' by firms as a component of mine development design, the current licensing boom will be associated with conflict. One of the important means for addressing this issue in decision-making process is generating a topographic map, which contains road networks, hydrology, forestry, conservation areas and settlements among other prohibited areas, with an overlay of the proposed and approved mining title. This information may be considered with the aim of reducing, where possible extenuating the negative impacts of mining from early stage of development. Similarly, 'mining' and 'land' rights overlapping that may create disputes would be adequately resolved at the initial period.

REFERENCES

Ayoade, E. (2007): Bitumen resources of Nigeria: status report. Senate Committee on Solid Minerals. Abuja: Nigeria, unpublished.

Bridge, G. (2004): Mapping the bonanza: geographies of mining investment in an era of neoliberal reform. The Professional Geographer, 56 (3), pp. 406-421.

ESRI (Earth Systems Research Institute), (2010): What is GIS? Overview. Available at: http://www.esri.com/what-is-gis/index.html [Accessed 20 April 2010].

Hodder, B. (1959): Tin mining on the Jos Plateau of Nigeria. Economic geography, 35 (2), pp.109-122.

Hodge, R.A. (2009): Mining and communities, what does it mean? [Letter] (Personal communication, 7 July 2009).

Kitchin, R. and Tate, N. (2000): Conducting research into human geography: theory, methodology and practice. Essex, UK: Pearson Education Limited.

Mining Act (2007): Nigerian Minerals and Mining Act 2007. Abuja: Ministry of Mines and Steel Development.

NPC (National Planning Commission), (2007): Nigeria millennium development goals report 2006. Abuja: NPC Headquarters.

Ondo State Government (2009): Business potentials in Ondo State (Investors' Guide). Available at: http://www.ondostate.gov.ng/bizpro.htm [Accessed 20 January 2011].

Owen, D. (2011): Setback for mine buffer zone plan. Leicester Mercury, 12 Feb.

UNDP (United Nations Development Programme), (2006): Niger Delta human development report. Abuja: UNDP. Lagos: Perfect Printer.

Robert, M.I. and Robert J.R. (1993): What is a geographic information system? Melbourne, Australia: DLSR, 1993.

Rural Law Online, (2009): Land and its uses: mining and quarrying. Australia: Victoria Law Foundation. Available at: http://www.rurallaw.org.au/handbook/xml/ch02s10.php [Accessed 21 July 2009].

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